

RF EXPOSURE EVALUATION

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) Radiation as specified in §1.1307(b)

Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f ²	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz * = Plane-wave equivalent power density

MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 * P * G}}{d}$$

$$\text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = Average RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 * P * G}{377 * D^2}$$

From the EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

MAX OUTPUT POWER

WIFI

Mode	Frequency (MHz)	Antenna	Conducted Power (dBm)	Duty Factor (dB)	Total Power (dBm)	Limit (dBm)	Verdict
802.11b	2412	Ant 1	12.24	0	12.24	30	Pass
802.11b	2437	Ant 1	12.19	0	12.19	30	Pass
802.11b	2462	Ant 1	12.24	0	12.24	30	Pass
802.11g	2412	Ant 1	11.65	0	11.65	30	Pass
802.11g	2437	Ant 1	11.28	0	11.28	30	Pass
802.11g	2462	Ant 1	11.16	0	11.16	30	Pass
802.11n(HT20)	2412	Ant 1	11.8	0	11.8	30	Pass
802.11n(HT20)	2437	Ant 1	11.23	0	11.23	30	Pass
802.11n(HT20)	2462	Ant 1	11.35	0	11.35	30	Pass

Measurement Result

Operation Frequency: WIFI: 2412-2462MHz for 802.11b/g/11n(HT20);

Power density limited: $1\text{mW}/\text{cm}^2$

Antenna Type: FPCB Antenna

Antenna gain: 1.8dBi

R=20cm

WIFI:

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density
		(dBm)		tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric	(mW/cm2)	(mW/cm2)
2412	802.11b	12.24	12±1	13	19.953	1.80	1.51	0.0060	1
2437		12.19	12±1	13	19.953	1.80	1.51	0.0060	1
2462		12.24	12±1	13	19.953	1.80	1.51	0.0060	1
2412	802.11g	11.65	11±1	12	15.849	1.80	1.51	0.0048	1
2437		11.28	11±1	12	15.849	1.80	1.51	0.0048	1
2462		11.16	11±1	12	15.849	1.80	1.51	0.0048	1
2412	802.11n HT20	11.80	11±1	12	15.849	1.80	1.51	0.0048	1
2437		11.23	11±1	12	15.849	1.80	1.51	0.0048	1
2462		11.35	11±1	12	15.849	1.80	1.51	0.0048	1

Conclusion:

For the max result : $0.006 \leq 1.0$ for Max Power Density, compliance RF exposure.

Portable device

According to §15.247(e)(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to KDB447498 D01 General RF Exposure Guidance V06

The 1-g SAR and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where:

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison

When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

Modulation	Channel Freq. (GHz)	Conducted power (dBm)	Conducted power (mW)	Tune-up power (dBm)	Max tune-up power (dBm)	Max tune-up power (mW)	Distance (mm)	Result calculation	1g SAR Exclusion threshold	SAR test exclusion
802.11b	2.412	12.24	16.749	12±1	13	19.953	<5	6.19753	7.50	YES
	2.437	12.19	16.558	12±1	13	19.953	<5	6.22957	7.50	YES
	2.462	12.24	16.749	12±1	13	19.953	<5	6.26144	7.50	YES
802.11g	2.412	11.65	14.622	11±1	12	15.849	<5	4.92287	7.50	YES
	2.437	11.28	13.428	11±1	12	15.849	<5	4.94832	7.50	YES
	2.462	11.16	13.062	11±1	12	15.849	<5	4.97364	7.50	YES
802.11n HT20	2.412	11.80	15.136	11±1	12	15.849	<5	4.92287	7.50	YES
	2.437	11.23	13.274	11±1	12	15.849	<5	4.94832	7.50	YES
	2.462	11.35	13.646	11±1	12	15.849	<5	4.97364	7.50	YES

Conclusion:

For the max result : $6.26144 \leq 7.5$ for 10-g SAR, No SAR is required.



Signature:

Date: 2019-09-10

NAME AND TITLE (Please print or type): Alex Li/Manager

COMPANY (Please print or type): Shenzhen NTEK Testing Technology Co., Ltd./ 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street Bao'an District, Shenzhen P.R. China.